

THE SURGICAL TREATMENT OF SIMPLE DILATATION OF THE STOMACH AND OF GASTROPTOSIS.¹

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BEFORE speaking of gastric dilatation and of gastrop-tosis, we must describe the normal limits of the stomach. As the surgeon will meet only with well-marked examples of the lesions, he need not concern himself greatly with the still active discussion as to the exact limits of the stomach,—a question which is so difficult to determine. He may take as normal the position advocated by Luschka (*Die Lage der Bauchorgane des Menschen*, 1873) and so ably supported by Meinert (*Centralblatt für innere Medicin*, 1896, p. 297). The cardiae orifice, according to these authorities, is fixed almost immovably at the level of the twelfth thoracic vertebra, and the pylorus lies behind a point on the free edge of the right costal border which would be intersected by a horizontal line passing through the tip of the ensiform cartilage. The lesser curvature passes from the latter point across the median line and then almost vertically upwards, forming a half circle around a line passing horizontally backward through the tip of the ensiform cartilage. According to Pacanowsky (*Deutsche Archiv f. klin. Med.*, 1887, xl, p. 342), when the healthy stomach is slightly distended, the lower limit of the organ, as determined by percussion, lies in the parasternal line three to five centimetres above the umbilicus in males, and four to seven centimetres above it in females. It is mani-

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festly of little importance to the clinician whether this percussion line coincides with the actual position of the lower border of the stomach or not, for he seeks only to ascertain the difference between the position of the stomach in health and in distention or in descent. Any error which belongs to the method of perensation would affect both cases in the same way, giving the line in each case too high or too low. He therefore need not attempt to settle the accuracy of the claim made by Martius and Meltzing based on a study of the limits of the stomach as found by examination with the diaphanoscope of Einhorn, that the greater curvature really descends much below this level (*Zeitschr. f. klin. Med.*, xxvii, 1895, Heft 3 and 4, p. 1893). Nor need he decide whether the extreme views of Doyen (*Archives prov. de Chir.*, iii, p. 673, and "Traitement chir. des affections de l'estomac," Paris, 1895), as to the vertical position of the lesser curvature and the fishhook-like shape of the antrum pylori are correct. In any case it remains certain that in the absolutely normal relations of the parts and with a normal thorax the pylorus is so sheltered as to be scarcely palpable, and that the lesser curvature will be entirely out of reach of the palpating hand, therefore, whenever these parts can be felt, we may assume that they have descended below their normal position, and that a more or less marked gastrophtosis is present, whether it is sufficient to be considered such from a pathological point of view or not.

(A) *Gastrectasia*.—The clinical term gastrectasia, or dilatation of the stomach, means something more than simple enlargement of that organ. The stomach may be considerably enlarged in individuals accustomed to coarse food, or to taking excessive amounts of solids and fluids, and yet the functions of the organ may not be disturbed and the walls may become sufficiently hypertrophied to deal with this abnormal quantity without difficulty. If this hypertrophy gives way to atony, or if hypertrophy should not take place, we have added the second factor in our idea of dilatation as a pathological condition, that is, motor insufficiency. We may therefore define gastrectasia as an enlargement of the stomach with motor insuffi-

ciency. As a result of the impairment of its muscular power, the stomach never completely empties itself, and the contained food constantly tends to increase in amount and undergoes fermentative changes. The motor insufficiency of which we speak is a relative insufficiency, a disproportion between the muscular power and the resistance to be overcome; hence, we may have normal muscular walls but an increased resistance at the outlet of the stomach, or normal conditions at the outlet but feeble muscular walls. In either case gastrectasia will generally follow, that is, an obstructive dilatation in the first place, and an atonic dilatation in the second. All obstructions at the pylorus are not followed by gastrectasia, because in many cases the hypertrophy of the muscular wall is sufficient to overcome the resistance and empty the stomach, a compensated condition being established similar to that often observed in valvular lesions of the heart. But all cases of simple motor insufficiency are not followed necessarily by dilatation, for the patient may not put more food in the stomach than the latter can pass on into the intestine without leaving an increasing residue behind.

With the obstructive form of dilatation we have nothing to do at present, as that is fully dealt with by others in this discussion. We may remark, however, that the treatment of this form consists in removal of the obstruction and in providing for a thorough drainage of the large pouch formed by the displaced greater curvature. In obstructive dilatation, the pylorus will be found generally displaced downward to such an extent as to give favorable drainage of the pouch when the new pylorus has been established, and the stomach seldom fails to recover its original dimensions when the resistance at the outlet is removed. In the exceptional cases in which dilatation remains after this relief, it may be that the pylorus has remained fixed in its normal position in spite of the dilatation, the stomach assuming the shape of the letter U as it dilates. In these exceptional cases gastro-enterostomy will be a better operation than attempting to overcome some be-

nign obstruction of the pylorus by pyloroplasty or pylorectomy. We shall refer to the operation of gastroplication later.

The usual cause of atony of the muscles of the stomach is some constitutional weakness (such as phthisis or chlorosis) which impairs the nutrition of the gastric muscles, and the custom of overloading the stomach with food or drink, especially with hasty habits of eating. Atony has also been observed as a reflex condition dependent upon the presence of an epigastric hernia. Atonic dilatation is very frequently associated with gastrophtosis, although the best authorities seem unable to agree upon the exact relation of the two. It is agreed, however, that gastrophtosis may result from the weight of an enlarged stomach stretching its attachment and causing its descent; and on the other hand that gastrophtosis may obstruct the escape of food from the stomach and cause an obstructive dilatation. Both of these relations of cause and effect appear to apply only to a few cases at either end of the chain; while in the great majority of cases the gastrectasia and gastrophtosis seem to be due to some common cause affecting the general nutrition of the body, sometimes with a strong element of nervous origin, just as neurasthenia and anaemia are connected.

The conditions hitherto mentioned result in a chronic dilatation, developing in the course of months or years; but there are a few extraordinary cases on record of acute dilatation of the stomach with violent symptoms generally resulting in death.

Some authors include in this class the cases of extreme overloading of the stomach with food, usually accompanying an alcoholic debauch, which often end fatally, but are sometimes cured by the use of the stomach-tube and by careful treatment. But in our opinion the cases of acute over-eating should be separated from those to which we have alluded, and which run the extraordinary course shown in the following case reported by Brown (*Lancet*, October 14, 1899, p. 1017).

A man fifty-five years old was admitted to hospital with the diagnosis of intestinal obstruction. While in his usual good

health, two days before admission, he had been seized with an intense pain in the abdomen and vomiting, which had continued nearly up to his admission. He was then in great pain, with marked symptoms of collapse. The abdomen was distended just above the pubes, flattened laterally and in the epigastrium, and dulness, fluctuation, and succussion could be obtained over the swelling. The abdomen was not tender to pressure. No urine had been passed since the beginning of the attack, but the introduction of a catheter brought only a drachm of bloody urine. The bowels had moved slightly before admission. An exploratory laparotomy revealed a cystic-looking tumor, which was opened and found to contain gas and a thick, dark, greenish fluid to the amount of three pints. On the supposition that the cavity was a pancreatic cyst, its walls were attached to the edges of the abdominal wound for drainage. The patient was relieved of pain by the operation, but succumbed five hours later. The autopsy showed that the supposed cyst was a displaced and distended stomach, with a capacity of five pints or more. There was no pyloric obstruction. The kidneys were saccular and inflamed.

Cases of this nature have been observed to follow a blow upon the abdomen, and operations upon the gall-bladder or stomach, and are marked by the accompanying suppression of urine. Vomiting may or may not be present. Some refer the dilatation to spasm of the pylorus, others to paresis of the stomach wall. Brown and Robson (*Lancet*, March 4, 1900, p. 832) refer to experiments of Carion and Hallion which showed that section of the pneumogastric nerves in dogs was followed by dilatation of the stomach and symptoms resembling uremia, the latter being supposed to be caused by absorption of toxins from the contents of the dilated stomach. The resemblance between the results of this experiment and the cases just described is very suggestive. Whatever the cause may be, it would appear that the use of the stomach-tube and medical treatment would fulfil the indications sufficiently, and would give more chance for recovery than a laparotomy could offer in a condition accompanied by such prostration.

Although chronic atonic dilatation of the stomach without obstruction of the pylorus is not uncommon in its milder

grades, it is very rarely found so exaggerated as to demand surgical interference.

The symptoms of atonic gastrectasia are a feeling of weight and fulness of the stomach after eating, but without pain, and often without impairment of the appetite. There is great thirst, for water is not absorbed by the stomach, and is very slow in reaching the intestine. Vomiting may be absent if there is no obstruction at the pylorus. Dyspnea, headache, dizziness, constipation (occasionally diarrhea) with marked emaciation are also found. There may be eructations of gas and boborygmi. The pulse is apt to be slow, even down to forty beats to the minute. The urine is scanty and concentrated.

Physical examination shows enlargement of the stomach by the various tests of inspection, palpation, and percussion. Peristaltic waves will be absent, as they indicate a stenosis of the pylorus with muscular hypertrophy. Succussion will be found at a much greater interval after eating than that at which it would be found in a normal stomach. The stomach should always be fully distended for examination by the bicarbonate of soda or the inflation methods. The stomach-tube will show the retention of food in the stomach long after it should have been passed on into the bowel. The motor insufficiency can also be tested by administration of salol, and Riegel remarks that the delayed disappearance of the characteristic action of ferric chloride on the salicylic acid in the urine (Huber) is a far more reliable sign of motor insufficiency than is a delayed beginning of the reaction. (In Nothnagel's "Spezielle Pathologie und Therapie," xvi, 2, p. 457.) The salicylic reaction should cease in twenty-six or twenty-seven hours after its appearance in healthy individuals. The main point in the diagnosis is a distinction between gastrectasia and gastrophtosis, as in both the lower limit of the stomach will be found lower than normal, and this is made by ascertaining the level of the lesser curvature, as will be described later.

There is no characteristic chemical change in the contents of the stomach in atonic dilatation, for these changes depend

upon the cause of the distention or upon the resultant or complicating disease of the mucous lining of the organ. Evidences of delayed digestion and of fermentation will usually be found.

The prognosis of atonic dilatation of extreme degree is not very favorable, but the changes are much slower in development than those of the similar condition of obstructive dilatation. Although such extreme grades of the lesion are rarely seen, an operation is indicated whenever a point is reached when lavage and medical and dietetic treatment fail to maintain the nutrition of the patient, as shown by a continuous loss of weight and strength. It is also indicated (and Riegel also suggests this) when the patient loses ground as soon as medical supervision is discontinued, or when his circumstances do not admit of the care and special diet which he requires long after he is discharged from actual medical treatment.

The surgical treatment of atonic dilatation may consist in gastroplication or in gastro-enterostomy.

Gastroplication, introduced by Bircher (*Correspondenz Blatt für schweizer Ärzte*, 1891, p. 713), whose efforts were seconded by Weir (*New York Medical Journal*, 1892, July 9, p. 29), is an operation which reduces the size of the stomach by folding its walls in upon themselves, retaining the folds by sutures. It has sometimes been called gastrorrhaphy, but this title should be reserved for the newer operation done for gastropsis, by analogy with nephorrhaphy. Robson (*Lancet*, March 24, 1900, p. 831) gives a list of twenty-eight cases taken from literature, including one of his own, with a mortality of two cases, or 7 per cent. One of the fatal cases, however, succumbed in syncope two weeks after the operation, and the death can hardly be ascribed to the operation. In fifteen cases no subsequent report was obtained, and in two others the case was followed only a few weeks, the condition being satisfactory up to that time. In one case pyloroplasty was done at the same time. In three others there was a stricture of the pylorus which in one case was left untreated, and in the others was subjected to pylorectomy and to pyloroplasty later.

Deducting all these there are only six cases by which to estimate the permanent results of the operation. Four of these patients (Bircher) were well 3, 3, $2\frac{1}{2}$, and 1 year after the operation; the others were well about one year and three months respectively (Moynihan, Hartmann).

It may well be claimed, then, that the operation will in properly selected cases give good results; but the difficulty lies in the selection. Weir's operation was performed because the stomach failed to regain its normal size after pyloric obstruction had been relieved, and the indication was clear, but such cases are extremely rare. Among the cases just enumerated there was one in which pyloroplasty was done at the same time, and experience teaches us that in such cases the gastroplication is unnecessary. There are three cases, also, in which a stricture of the pylorus was operated upon at a later date or left untouched, and these were clearly cases in which the gastroplication should not have been done. It will be easy, as a rule, to recognize the more evident causes of pyloric obstruction, cicatrices, tumor, adhesions, etc., and all of these conditions contraindicate gastroplication, for the obstruction itself must be removed or a gastro-enterostomy be performed. But there is one form of obstruction, spasmodic contraction of the pylorus, which may elude even careful investigation, as it has been known to disappear under deep anaesthesia. Without accepting the extreme views of Doyen and other French authorities as to the great frequency of this condition and its importance as a cause of all varieties of gastric lesions, it must be recognized as by no means uncommon. The writer himself has found and treated it successfully in two cases by pyloroplasty. Bennett's case is extremely instructive in this regard (*British Medical Journal*, February 3, 1900, p. 241). He operated upon a man with extreme gastrectasia, and finding no cause of obstruction, the pylorus seeming healthy and not thickened, he did a gastroplication. The patient remained remarkably well for a time, but the symptoms returned and death ensued, and at the autopsy the lumen of the pylorus was found contracted to the size of an English urethral bougie,

No. 14. He believes that a spasm existed at the first operation, which was not recognized either because it relaxed or because no attempt was made to introduce the finger into the lumen. Bennett quotes other cases to show the disappearance of spasm during deep anaesthesia or after death, and other surgeons corroborate this opinion (Morison, *Lancet*, February 26, 1898). It is evident from these facts that the examination of the pylorus should be made with the greatest care, and that passage should not be declared normal unless the forefinger can be introduced into it by inverting the stomach wall.

As to the details of the operation, several modifications of Bircher's original method of inverting a longitudinal fold and securing it with a single row of sutures have been made. Weir's modification, which seems to the writer the most satisfactory of all, consists in using several lines of suture instead of a single one, thus holding broad surfaces of the stomach together, avoiding the dead space left in the fold by Bircher, and giving greater security against relapse. Brandt (*Centralblatt für Chirurgie*, 1894, p. 361) made several small parallel folds on each wall of the organ, and Bennett (*Lancet*, July 4, 1896, p. 8) made several folds on the anterior wall, a single line of sutures being passed so as to pick up the apex of every fold with every suture, all of the folds being thus secured by a single knot for each suture. The method employed appears to have had no effect upon the ultimate results.

The rival of gastroplication in these cases is gastro-enterostomy. The risk in the latter operation is of course much greater, but in skilful hands the mortality for gastro-enterostomy for any cause except malignant disease has fallen to about 10 per cent., although we can hardly grant Doyen's claim that it is absolutely free from danger. But it has the great advantage that if the surgeon should chance to overlook some cause of pyloric obstruction, his patient will be sure of a cure if he survives the operation, whereas gastroplication will be useless if pyloric obstruction exists. In conclusion, we may say that gastroplication is a good operation for those extremely rare cases of gastrectasia absolutely independent of obstruction

of the pylorus, but that nearly all cases of gastrectasia demand some more radical treatment, which will remove the cause as well as rectify the distention.

(B) *Gastrophtosis*.—Gastrophtosis has only recently been brought within the possibilities of surgical treatment, although the idea of at least partial descent of the stomach is older than Glenard's famous description of enteroptosis, being known by the name of "vertical stomach" at that time. By gastrophtosis we understand the moving downward of the lower portion of the stomach, as evidenced by a change in position of the lesser curvature. As the cardiac orifice is fixed at the diaphragm, a complete descent of the stomach is impossible; the cardiac end remaining in contact with the diaphragm even when the greater curvature or pylorus reaches downward to the pelvis. According to Riegel (*loc. cit.*), we may distinguish three forms: (1) a descent of the pylorus to a moderate degree, bringing the lesser curvature from under the liver and into full view when the stomach is distended; (2) "vertical stomach," in which the pylorus has sunk so far as to render the lesser curvature vertical in its full extent; and (3), least common of all, a descent of the lesser curvature while the pylorus remains fixed, giving the organ a shape like the letter U. The first grade of the descent of the pylorus is so common that one seldom fails to feel the pylorus distinctly in adults unless the abdominal walls are very rigid. Meinert, indeed, claims that 80 to 90 per cent. of women have gastrophtosis, although only about 5 per cent. of men are so afflicted.

According to some, the main cause for gastrophtosis is the wearing of clothing which constricts the lower part of the chest, a corset or belt of any kind. Others ascribe it to various congenital or other malformations of the thorax, or any disease with enlargement of the liver or a low position of the diaphragm. In some cases it is evidently the result of loss of support below, as in women who have borne children, and who have in consequence flaccid abdominal walls. In still others it appears to be a sequel of gastrectasia; although this cannot apply to the majority of cases, as already explained. Some

have claimed that the descent of the right kidney was the beginning of gastrophtosis loosening the peritoneal attachment, and causing obstruction of the duodenum by traction, with resultant gastrectasia and descent of the stomach. (In three of Rovsing's four cases of gastrophtosis the right kidney was low, but there was no gastrectasia.) Glenard's theory of primary descent of the ascending colon and hepatic flexure is evidently incorrect, because this lesion is often absent in marked gastrophtosis.

Considerable malposition of the stomach may exist without symptoms. There appears to be little relation between the extent of the malposition and the severity of the symptoms, although extreme cases are likely to present well-marked symptoms. When symptoms exist, they seem to be chiefly due to some obstruction to the outlet of the stomach, although the latter may not respond to this by actual dilatation. There is some difficulty of digestion, with a tendency to fermentation, eructations, and boborygmi. The motor function is disturbed, secretion is interfered with, and sometimes distinct pain is felt in the organ. Rovsing (*loc. cit. inf.*) says that there is often a characteristic pain in the umbilical and hypogastric regions, which is relieved by lying down, and not influenced by taking food unless the latter is in large amount. Nervousness, neurasthenia, hysteria, and neuralgia often accompany this condition; and it has been claimed by some that they are its results, by others that they are its cause. It may be that both views contain some truth. If the stomach becomes dilated as well as displaced, all the symptoms of that condition are added. The emaciation in these cases reaches the most extreme degree.

Physical examination will reveal the malposition, and may show dilatation of the stomach as well. On inspection the epigastrium looks depressed, the umbilical region fuller than usual. Unusual flaccidity of the abdominal walls may be evident. Peristaltic and even antiperistaltic waves may be seen to take place in the stomach. Palpation will sometimes reveal the outline of the stomach and will often elicit succussion

or splashing. Auscultation may prove useful by locating gurgling at the pylorus, indicating the obstruction lie or just beyond in the duodenum. But absolutely necessary to a diagnosis from dilatation of the stomach is the distention of that organ by giving large doses of bicarbonate of soda and tartaric acid separately, or by inflation of the stomach with air through the tube. When the organ is thus distended, the lesser curvature comes at once into view, and the outlines of the pyloric end stand out clearly in an abnormally low position.

It is only recently that surgery has had anything more to offer for the improvement of this condition than the recommendation to wear an abdominal supporter. Hannecart (*Journal Médical de Bruxelles*, 1898) relates two cases operated upon by Depage five years previously by removal of a T-shaped portion of the abdominal wall, the transverse incision extending across from one eleventh rib to the other, and the vertical one from that level to the pubes, sufficient in width being removed to considerably reduce the capacity of the abdomen, and afford better support to the viscera. At the same time the ligaments of the liver were shortened and secured in the upper angle of the wound. The ultimate results of the operation were excellent. No other surgeons appear to have attempted this radical procedure. In June, 1895, Treves (*British Medical Journal*, 1896, i, p. 1) operated upon a young woman twenty-two years of age with marked enteroptosis, and found the omentum adherent to a mass of tuberculous glands in the mesentery, preventing him from raising the stomach. He removed the glands, and then could restore the stomach and liver, both of which were markedly displaced. He secured the liver in place with "three stout silk sutures. These concerned the lines of the falciform ligament and the umbilical fissure. The most important stitch was passed through the liver near its edge, and penetrated the round ligament, which afforded a most substantial holding. The other stitches involved the round ligament and the falciform ligament. Above, the sutures were passed through the fibrous structures of the parietes by the side of the xiphoid cartilage." Five months later

the patient continued in health. In 1896, Duret, of Lille (*Revue de Chirurgie*, 1896, p. 421), performed a laparotomy, making a median incision above the umbilicus, leaving the peritoneum intact in the upper half, and passed a continuous suture through the anterior wall of the stomach without penetrating to the cavity of the latter and through the undivided parietal peritoneum, at the level of the fold about the round ligament of the liver. The result was good and the patient was in excellent condition and relieved of her gastric symptoms two months afterwards. In January, 1898, Rovsing (*Archiv für klinische Chirurgie*, Ix, 812) operated upon another case with a good result, and since then upon three others. Rovsing employed three silk sutures so placed as to hold a broad surface of the anterior wall of the stomach against the parietal peritoneum, leaving the pyloric region and the greater curvature free.

This operation of Duret has been named gastropexie, but by analogy with the operation of nephorrhaphy, gastrorrhaphy would be a better title. In all there are five cases, with no operative accidents. All the patients were benefited, and one remained well eighteen months after the operation. Three were well two or three months after operation. The fifth patient died of tuberculosis in two months. In two of his cases Rovsing did nephorrhaphy on the right kidney at the same time, and in a third as a secondary operation, with good results.

Davis (*Western Medical Review*, October 15, 1897) records two operations for gastrophtosis. One occurred in a man sixty-three years of age, who had been successfully operated upon for ventral hernia a few months previously. "The stomach was drawn up to its natural position, and the lesser omentum near its reflection from the stomach was fastened to the peritoneum near the ensiform with fine silk sutures. The stomach was not greatly dilated." Reefs were taken in the mesocolon and in the mesentery also. Two months later the patient was "improved." His other case was in a woman of thirty years, with displacement of the lesser curvature of the stomach to within an inch of the umbilicus. Sutures were in-

serted in the same manner as in the first case, and a gastropli-
cation was performed at the same time. The patient recovered.

Terrier and Hartmann ("Chirurgie de l'Estomac," Paris, 1899) record a similar operation, in a woman thirty-one years old, with dilatation and descent of the stomach. Hartmann operated, doing a gastroplication, and at the same time elevating the organ and securing it to the abdominal walls. Stengel and Beyea (*American Journal of the Medical Sciences*, 1899, exvii, p. 667) report a case operated upon by Beyea, the sutures being differently placed, for fear that the adhesion to the abdominal wall might have disagreeable consequences. The operation was performed in April, 1898. The patient was a woman twenty-six years old, who had previously had nephrorrhaphy done with partial relief of her symptoms. The stomach lay with its lesser curvature one and one-half inches above the umbilicus. "Interrupted sutures were introduced to shorten the gastrohepatic omentum. The first suture caught the gastrophrenic ligament above at a point as near as possible to the diaphragm (a distance of about two inches from the dia- phragm) and below just above the gastric vessels. The second suture was introduced about one-fourth of an inch from the first one, followed by a row of eight or ten others, to include the left three-fourths of the gastrohepatic omentum. After this had been accomplished the stomach was seen to occupy what was thought to be a normal position." Fine silk was employed. She was kept lying upon her back ten weeks after the operation. One year later the patient had gained nineteen pounds in weight and felt better and could eat freely. The lesser curvature is said to have been well supported, but the diagram given displays it as lying half-way between the ensiform and the umbilicus, much below its natural position, although considerably higher than before the operation.

To resume the facts brought out by these operations for gastroprosis, it is evident that improvement is not difficult to bring about, whether one secures the liver only, sutures the stomach itself or the mesocolon to the abdominal wall, or shortens the gastrohepatic omentum, or, finally, removes a seg-

ment of the abdominal wall. The condition is usually a complex one, and probably a simple gastrorrhaphy will not be sufficient, but should be assisted by right nephorrhaphy, hepatorrhaphy, and in some cases, perhaps, by the Depage-Hannecart operation. In women similar supporting operations will be necessary upon the genital organs as well, in order to assure a good result.

[NOTE.—Since this paper was read, an important article by Treves, "On Ptosis of the Liver, etc.," has appeared in the *Lancet*, 1900, Vol. i, p. 1339.]